

VERTICAL AND HORIZONTAL FORCES: A FRAMEWORK FOR UNDERSTANDING AIRPOWER COMMAND AND CONTROL

A Monograph

by

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ABSTRACT

VERTICAL AND HORIZONTAL FORCES: A FRAMEWORK FOR UNDERSTANDING AIRPOWER COMMAND AND CONTROL, by Major Robert L Grant, Jr., USAF, 45 pages.

For four decades, the Air Force has maintained the master tenet of “centralized control, decentralized execution.” Changes in the contextual environment and advances in systems theory indicate that while the framework regarding the placement of control and decision making within the system remains important, a more robust cognitive approach would help commanders think through and understand how command and control (C2) systems work best today. The central question of the monograph is “do vertical and horizontal forces better describe the competing tensions within a command and control system?”

To provide context as to why questions over centralization and decentralization of air power control dominate Air Force thinking, the monograph begins with a historical overview of the tenet. The proposed cognitive framework moves beyond centralization-decentralization issues and examines C2 systems from a vertical and horizontal perspective. Forces within the vertical dimension represent integrative aspects of the system and include facets such as security, collectivity, order, uniformity, and stability. The horizontal dimension includes the forces of freedom, individuality, uniqueness, change, and complexity. These ten forces work in a qualitative manner within tension pairs. Using a case study methodology, the monograph evaluates airpower C2 operations during the Korean War using the vertical-horizontal framework.

Three major findings emerged after applying the framework. First, C2 systems require a balanced presence of both vertical and horizontal aspects to achieve effectiveness. Second, the quality of the interaction among C2 nodes is more critical to success than overall interoperability. Third, C2 systems naturally tend towards differentiation, and commanders will find it more challenging and difficult to create effective C2 integration without inadvertently sacrificing key aspects of differentiation. Based on these findings, an update to the Air Force’s master tenet would help emphasize the vertical and horizontal forces that better describe C2 systems without discarding critical lessons about unity of command for air operations. The proposed, modified tenet is *integrated command and distributed control*.

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ACRONYMS

5AF	Fifth Air Force
AOC	Air Operations Center
C2	Command and Control
FEAF	Far East Air Forces
FEC	Far East Command
GHQ	General Headquarters
JFACC	Joint Forces Air Component Commander
JOC	Joint Operations Center
NKPA	North Korean Peoples' Army
OODA	Observe, Orient, Decide, Act
UNC	United Nations Command
USAF	United States Air Force
USMC	United States Marine Corps
WWII	World War Two

The problem of commanding and controlling armed forces, and of instituting effective communications with and within them, is as old as war itself.¹
—Martin Van Creveld, *Command in War*

INTRODUCTION

In his 2010 article about improving airpower command and control at the operational level in Afghanistan, Lieutenant General Michael Hostage wrote that the Air Force had allowed technology and doctrine to drive command and control (C2) design. Technology had drastically reduced “the need for close proximity to sustain communication or to command and control airpower,” while doctrine emphasized centralized control of airpower by an airman.² No longer able to justify these factors within the given context of operations in the airspace over Afghanistan and the broader Middle East, General Hostage updated the C2 system and decision authorities for lower echelons of command.³ Like General Hostage, Joint Forces Component Commanders (JFACC) face C2 design problems in every theater of operation. How a commander goes about solving C2 design problems can vary, but many approaches have associated pitfalls.

Air Force Basic Doctrine warns JFACCs and other commanders against easy technological solutions such as relying on video feeds from unmanned aerial vehicles, often to the detriment of other operational-level responsibilities.⁴ Additionally, commanders should avoid what Carl von Clausewitz called “routine” based solutions, where leaders might “act in accordance with pre-established patterns” and rely on previous methods without fully considering

¹Martin Van Creveld, *Command in War* (Cambridge, MA: Harvard University Press, 1985), 1.

²Air Force Doctrine, vol. I, *Basic Doctrine* (Maxwell AFB, AL: Air Force Doctrine Center, Oct 2013), 34. Note: Throughout this document, the word ‘airpower’ is spelled without a space in accordance with current Air Force doctrine. At times, the word will include a space between the words air and power—air power—when quoting original material that uses that format.

³Mike Hostage, “A Seat at the Table: Beyond the Air Component Coordination Element,” *Air & Space Power Journal* (Winter 2010): 18-20.

⁴Air Force Doctrine, Annex 3-30, *Command and Control* (Maxwell AFB, AL: Air Force Doctrine Center, 1 June 2007), 16-18.

contextual factors.⁵ Even worse, dogmatic application of doctrine shows a lack of critical thinking that often induces inefficiencies or leads to less effective execution. Instead, commanders might find success with a more robust cognitive framework from which to ask questions and think through C2 design problems. Today, there is a danger of relying upon a centralized-decentralized dichotomy to frame C2 system design approaches; furthermore, many scholarly works highlight the fundamental issues when commanders use a centralized-decentralized framework. Several theorists point out that the 21st century operating environment makes finding the right balance of centralization and decentralization in C2 systems an arduous, if not precarious, endeavor.

Present-day environmental characteristics such pervasive changes in technology, globalization, and adversaries, make decisions regarding centralization versus decentralization problematic for commanders. Undreamed of technological capabilities just a few years ago now permit highly-centralized decision making to occur thanks to fiber optics, computer networking, and space-based communications. At the same time, these technologies enables military forces to decentralize and network, rather than adhere to a rigid hierarchy.⁶ Additionally, globalization has made international engagement and conflict a significantly more complex problem, creating conditions that favor highly localized approaches and decentralized decision-making, while the same conditions increase political risk that often leads statesmen and generals to centralize decision-making. Finally, as a result of technological and globalized trends, the hybrid and decentralized nature of opponents adds further complexity to warfare. While these manifestations of technology and social change characterize the current environment, technology, cultural, and

⁵Carl von Clausewitz, *On War*, trans. and ed. Michael Howard and Peter Paret (Princeton, NJ: Princeton University Press, 1976), 152-154.

⁶Bruce Berkowitz, *The New Face of War: How War Will Be Fought in the 21st Century* (New York, NY: The Free Press, 2003), 19.

social conditions have always shaped warfare.⁷ And though problems related to where to place decision making authorities will always factor into C2 systems, the changing environment indicates that there are broader factors to consider than simply centralization-decentralization issues.

Perhaps a different *conceptual* framework based on *vertical* and *horizontal forces*—in addition to the centralized-decentralized way of thinking—would help commanders arrange C2 systems for air operations. In the search for a broader understanding of how things actually work when developing C2 systems, the question is “*do vertical and horizontal forces better describe the competing tensions within a C2 system?*” Inspiration for vertical and horizontal forces comes from Jamshid Garajedaghi’s sociocultural model of systems, where he identifies ten aspects—or ‘forces’—that tend to integrate or differentiate elements of a system. Additionally, the book *The Starfish and the Spider*, by Ori Brafman and Rod A. Beckstrom provides several ideas regarding aspects that enable vertical and horizontal forces within the operational environment. Ultimately, commanders may improve their understanding toward developing C2 systems by using a vertical-horizontal framework from which to synthesize relevant factors.

Determining the validity of this hypothesis requires a deliberate methodology. A case study approach provides the methodology through which to apply and test the vertical-horizontal cognitive framework. The monograph’s four main sections progress in a deliberate manner: 1) reviewing current C2 models and introducing the sociocultural system model, 2) developing the vertical-horizontal framework, 3) applying the framework to the Korean War, and 4) analyzing the case study’s lessons to determine future implications. Section 1 describes the Air Force’s historical use of the centralized-decentralized framework, why that framework is important, along with the limitations of using the centralized-decentralized approach. The section then introduces

⁷Michael Howard, *War in European History* (New York, NY: Oxford University Press, 2009), xi.

the sociocultural system theory as an alternative approach for exploring and understanding C2 systems. Section 2 defines and characterizes vertical and horizontal forces based on doctrine and practice. The vertical forces include *security, stability, collectivity, uniformity, and order*, while the horizontal forces involve *freedom, change, individuality, uniqueness, and complexity*. The section then describes how tension among the ten forces works. These ten forces exist in tension pairs: security-freedom, stability-change, collectivity-individuality, uniformity-uniqueness, and order-complexity. These pairings and the qualitative tensions between the forces help commanders describe the overall tension within a C2 system. Section 3 moves from the theoretical to a real-world application in order to test how the construct works. The Korean War provides a historical scenario through which to apply and then assess an operational C2 system and the factors surrounding the employment of airpower from 1950-1953. Section 4 analyzes the observations and lessons generated from applying the vertical-horizontal model to the Korean War, and provides recommendations for the future of Air Force C2 theory.

Air warfare cannot be separated into little packets; it knows no boundaries on land and sea other than those imposed by the radius of action of the aircraft; it is a unity and demands unity of command.⁸

—Air Marshal Arthur Tedder

BEYOND QUESTIONS OF POWER AND AUTHORITY

Significance And Background

Colonel Philip Meilinger, a prominent Air Force scholar, writes, “Air Power’s unique characteristics necessitate that it be centrally controlled by an airman.”⁹ Yet based on experience and study, General Hostage concluded that centralized control “comes with a cost” to include

⁸William W. Momyer, *Airpower in Three Wars* (Washington DC: US Government Printing Office, 1978), 95.

⁹Phillip S. Meilinger, *10 Propositions Regarding Air Power* (Washington DC: Air Force and Museums Program, 1995), 49.

“hampered discourse and cooperation with our joint partners;” however, he found that it is equally costly to duplicate all AOC functions across the vast number of Army tactical operation centers.¹⁰ So what is the Air Force to do? Recognizing that there are definitive drawbacks to “centralized control,” the Chief of Staff of the Air Force, General Mark Welsh, released a core missions document in late 2013 calling for “centralized command, distributed control, and decentralized execution.”¹¹ Without further explanation, it remains unclear why the change in wording was necessary—at least in the short term. For now, it reveals evolving thinking about centralized versus decentralized control of airpower.

Reviewing the history of the Air Force master tenet shows how and why centralization came to dominate Air Force thinking regarding airpower control. The initial idea of the master tenet coalesced in the middle of World War Two (WWII) as a result of Allied lessons after repeated losses in North Africa. These losses stemmed partly from a lack of air superiority and airpower flexibility. Scholar Richard Overy observed that inter-service politics prevented effective airpower employment.¹² Furthermore, Air Marshal Arthur Tedder succinctly characterized the reality of the situation and the nature of the lessons learned when he said “air warfare . . . is a unity and demands unity of command.”¹³ This led the Army to rethink its doctrine in order to develop “effective operational air power” guidelines, calling for greater

¹⁰Hostage, “A Seat at the Table,” 18.

¹¹U.S. Department of the Air Force, *Global Vigilance, Global Reach, Global Power for America* (Washington DC: Department of the Air Force, 2013), 9.

¹²Richard Overy, “The Air War in Europe, 1939-1945,” in *A History of Air Warfare*, ed. John Andreas Olsen (Washington DC: Potomac Books, 2010), 41.

¹³Momyer, *Airpower in Three Wars*, 95.

overall centralization of airpower.¹⁴ In 1943, the Army and its Air Corps included the following line in Field Manual 100-20: “control of available air power must be centralized.”¹⁵

Ten years later at the end of the Korean War, the US Air Force updated the tenet to “centralized overall direction and decentralized control.”¹⁶ During the Korean War, the US Navy and Marine Corps dissented against Far East Air Force attempts at centralized control across all air assets. Stymied by inter-service entrenchment, the Air Force searched for a way to codify principles that encouraged unified employment across all service’s air arms—that is, centralized direction in the form of planning while acknowledging individual service control. Almost two decades later, the Air Force once again modified the tenet in the early 1970s, returning to centralized control but modifying the second half of the tenet to emphasize decentralized execution. The Air Force captured the phrase “centralized control, decentralized execution” in doctrine out of frustration with civilian leadership’s influence over airpower operations at the tactical level during the Vietnam War.¹⁷

Contextual shifts in 1986 and 1991 did not cause the Air Force to alter the master tenet. The deficiency of a single air commander during Vietnam contributed to dismal operational results.¹⁸ To remedy this, the 1986 Goldwater-Nichols Act implemented organizational C2 changes to get the services’ individual air elements to cooperate better by creating the JFACC concept, which further centralized air operations. In 1991, the United States aggregated control of Air Force, Navy, and Marine Corps air assets under a JFACC during Operation DESERT

¹⁴Overy, “The Air War in Europe,” 41.

¹⁵U.S. War Department, Field Manual 100-20, *Command and Employment of Air Power* (Washington DC: War Department, 21 July 1943), 2.

¹⁶Air Force Manual 1-2, *United States Air Force Basic Doctrine* (1 Apr 1953), 5.

¹⁷Steven E. Ankerstar, “Beyond Centralized Control and Decentralized Execution” (monograph, School of Advanced Air and Space Studies, Air University, 2005), xi-xii.

¹⁸Mark Clodfelter, *The Limits of Air Power: The American Bombing of North Vietnam* (New York, NY: The Free Press, 1989), 129.

STORM.¹⁹ The successful integration of airpower through the JFACC (albeit with some dissention from the US Marine Corps and Navy) strengthened the ‘centralized control’ principle. Since 1991, two decades of unquestioned air supremacy against adversaries made it easier for the Air Force to solidify centralization of airpower C2 at the operational level.²⁰ Essentially, the tenet remains unchanged four decades later.

Based on the evolving global context of the last fifteen to twenty years, some scholars re-analyzed the centralization-decentralization approach, searching for ways to better frame or change the Air Force’s master tenet of “centralized control, decentralized execution” based on new insights regarding systems theory.²¹ Some theorists even argued that the master tenet no longer applies. The study of complex adaptive systems theory led many theorists to conclude that military organizations should shun centralized control altogether.

In the Air Force several theorists, including many Advanced Study Group graduates, proposed a variety of changes to the service’s master tenet. Major Mark Blomme recommended the tenet of “Centralized Command and Decentralized Control of Distributed Operations.”²² Major David Gerber proposed a fully decentralized C2 model, calling for “adaptive command and control” based on complex adaptive systems.²³ Lieutenant Colonel Clint Hinote advocated “centralized command and control, decentralized execution,” while Major Steven Ankerstar

¹⁹Edward C. Mann III, *Thunder and Lighting: Desert Storm and the Airpower Debates* (Maxwell AFB, AL: Air University Press, April 1995), 118.

²⁰Ankerstar, “Beyond Centralized Control,” xiii-xviii.

²¹Air Force Doctrine, vol. I, *Basic Doctrine*, 34.

²²Mark E. Blomme, “Decentralizing Centralized Control: Reorienting a Fundamental Tenet for Resilient Air Operations” (monograph, School of Advanced Military Studies, 2008), 61.

²³David K. Gerber, “Adaptive Command and Control of Theater Airpower” (monograph, School of Advanced Airpower Studies, 1997), 93.

suggested abandoning the master tenet altogether.²⁴ Often times scholars simply suggested a multitude of questions to help commanders clarify the problems inherent in a centralized-decentralized approach.²⁵ In 1999, Gerber summarized these debates over airpower C2 stating that the search for the “ideal” balance between centralization-decentralization “remains as elusive as ever.”²⁶

The Centralization-Decentralization Dichotomy: Important but Incomplete

Military organizations frame the issue of C2 in terms of centralization-decentralization, using those terms regularly since the time of Napoleon. In the early 1800s, at a time when most commanders primarily used a clockwork metaphor to conceive how warfare works, Napoleon made innovative changes to his organizational structure and command philosophies. These modifications enabled him to implement significant ideological transformations regarding the conduct of warfare. The previous clockwork model called for keeping strict control and centralization of authority, while Napoleon conceived the need for greater authority and a degree of autonomy down to the corps level. This change in understanding enabled greater initiative under the condition of uncertainty. The new approach reflected a more thermodynamic model of warfare and started the slow demise of the clockwork metaphor.²⁷ With these changes, Napoleon employed his forces over a much larger geographical area with increased flexibility at the corps

²⁴Clint Hinote, “Centralized Control and Decentralized Execution: A Catchphrase in Crisis?” (research paper 2009-1, Maxwell AFB, AL: Air Force Research Institute), 56.

Ankerstar, “Beyond Centralized Control,” xlvii.

²⁵Hinote, “Centralized Control and Decentralized Execution,” 59-62. Lt Col Hinote proposed the five questions to help commanders assess C2 design factors. The five questions are: (1) What is the nature of the operation, (2) Where should flexibility be preserved, (3) How many assets are available, (4) What is the Geographical range of effects, and 5) Who has the best situational awareness?

²⁶Gerber, “Adaptive Command and Control,” 1.

²⁷Antoine Bousquet, *The Scientific Way of Warfare: Order and Chaos on the Battlefields of Modernity* (New York, NY: Columbia University Press, 2009), 76-77.

level.²⁸ Below the corps level, the new social-political reality of democratic revolution, *levee en mass*, and the citizen soldier sparked new tactics that reflected the change in ideology. As Peter Paret observed, an empowered “skirmisher” marked a clear “difference between the old and new—between drilled mechanical obedience and [the] self sufficient” soldier and commander.²⁹ Napoleon executed the first real decentralization of authority of consequence.

Jamshid Gharajedaghi, a preeminent systems theorist, describes centralization-decentralization as a matter of power and choice.³⁰ Another way to think of centralization-decentralization is to consider the amount of power and choice divested to the individual versus maintained at the organizational level. Centralization and decentralization questions are important and necessary conceptual considerations for C2 systems design since the ultimate purpose of a C2 system is to facilitate decision-making. Setting effective decision criteria and empowering subordinates with clear authorities helps senior commanders achieve mission objectives in complex environments. Unfortunately, the centralization-decentralization construct inherently creates tension among actors within the C2 system, stemming from issues of power sharing. At the extremes, issues of power either lead to subordinate’s suffocation due to over-centralization, or to chaos due to over-decentralization.

Dichotomous thinking requires an ‘either-or’, ‘zero-sum’ choice that in this case, places power and control at odds with autonomy. Dichotomy often produces false choices that if taken out of context, will miss out on a whole host of issues that matter. Furthermore, dichotomy alone does not provide a disciplined methodology to analyze a C2 system within the environment.³¹

²⁸Van Creveld, *Command in War*, 61.

²⁹Peter Paret, *The Cognitive Challenge of War: Prussia 1806* (Princeton, NJ: Princeton University Press, 2009), 14-15.

³⁰Jamshid Gharajedaghi, *Systems Thinking: Managing Chaos and Complexity: A Platform for Designing Business Architecture*, 2nd ed. (New York, NY: Elsevier, 2006), 71.

³¹*Ibid.*, 38-39.

Dichotomous thinking fails to consider in an orderly way other facets that impact power sharing within a C2 system. On the other hand, systemic thinking provides a broader approach to C2 design than does the centralized-decentralized dichotomy alone. The sociocultural systems model can aid commanders in thinking *systemically* about the environment within which the C2 system operates.

Sociocultural Systems

Gharajedaghi developed a theory called the sociocultural model to address human interdependencies in a system. In simple terms, any system that is not mechanically or biologically based on energy input-output is likely a sociocultural one. When humans comprise a system, then by definition the sociocultural model applies. The model is described as ‘social’ in reference to the fact that the actors are united within the structure by information, as opposed to mechanical systems united through the principles of physics. The socially driven information exchange creates shared understanding and learning amongst the actors. The model is culturally based as well because culture defines how humans observe and initially understand events. Culture gives humans their ‘default’ answer to problems; only interactive information sharing and learning can override these default answers.³² The US Marine Corps (USMC) described this interaction as *reciprocal influence*, where superior and subordinate elements of a C2 system bring about learning and adaptation based on the relational interaction and recommendations of subordinates to commanders.³³ When commanders develop an operational C2 system, the sociocultural model might prove useful as a cognitive framework from which to work.³⁴ One way to describe the sociocultural model’s interactions is as *vertical* or *horizontal* effects that tend

³²Gharajedaghi, *Systems Thinking*, 83-88.

³³Marine Corps Doctrine Publication (MCDP) 6-0, *Command and Control* (Washington DC: Department of the Navy, 4 October 1996), 46-47.

³⁴Gharajedaghi, *Systems Thinking*, 83-88.

towards greater *integration* or *differentiation* respectively. This differs significantly from centralized-decentralized questions regarding the *distribution of power* within the C2 system.

Vertical and horizontal concepts differ from issues about centralization and decentralization. Vertical and horizontal forces describe the degree of incorporation and distinction regarding the sub-systems and individuals that comprise a C2 system overall. Centralization and decentralization describes who has decisional authority, the role of rules, the organization's structure, and the degree of distributed control within the C2 system.³⁵ Conceptually, vertical-horizontal forces encapsulate centralization-decentralization issues when addressing the forces of collectivity and freedom, but the centralization question regarding decision-making empowerment is such an important and significant part of C2 that it cannot be subsumed completely. When it comes to human-based, open systems, commanders should address both centralization-decentralization aspects of the system as well as vertical-horizontal forces. By addressing vertical and horizontal forces first, a commander will begin to gain understanding regarding how to approach issues of empowerment.

VERTICAL AND HORIZONTAL FORCES

Vertical and horizontal forces describe the competing facets of the operational C2 system. Vertical forces exhibit integrating effects, drawing the systems towards “increased order, uniformity, conformity, [and] collectivity,” while horizontal forces display differentiating effects, pulling the system towards “increased complexity [and] variety.”³⁶ The sociocultural model identifies five vertical and five horizontal forces that describe aspects that influence the system.

³⁵Ori Brafman and Rod A. Beckstrom, *The Starfish and the Spider: The Unstoppable Power of Leaderless Organizations* (New York, NY: Penguin Group, 2006), 19.

³⁶*Ibid.*, 92.

Vertical forces include security, stability, collectivity, uniformity, and order. Horizontal forces include freedom, change, individuality, uniqueness, and complexity.³⁷

Since Gharajedaghi does not clearly define or describe the forces in relation to a particular type of system, the following section explores each force using a basic dictionary definition, doctrinal concepts where applicable to provide clarity, and pulls from personal experience when needed to relate the specific forces to a C2 system. The purpose is to provide a working understanding of each force to facilitate application when designing C2 systems.

Vertical Forces: Security, Stability, Collectivity, Uniformity, and Order

Vertical forces inform a commander's understanding regarding the degree of integrative effects within the C2 system and environment. In general, the more the system or environment exhibits characteristics of a particular vertical force, the greater the vertical pull towards integration, consolidation, and simplification. Also, the forces work in concert, often reinforcing each other, so that the strong presence of one force likely bolsters forces in the same dimension.

The first vertical force, *security*, is “freedom from risk or danger; the degree to which a program or device is safe from unauthorized use.”³⁸ Security encompasses physical and informational security. Regarding physical security, Air Force Doctrine Annex 3-30, *Command and Control*, warns against “threat(s) of physical violence” to C2 nodes.³⁹ Hardening and minimizing C2 threat exposure is a common response to increase threats, especially when many airpower C2 nodes are considered ‘high demand, low density’ or ‘high value airborne assets.’ In

³⁷Brafman and Beckstrom, *The Starfish and the Spider*, 92. This should not be confused with vertical and horizontal information “flows” that are used to describe data or knowledge as it moves throughout any given C2 system. See Air Force Doctrine, Annex 3-30, *Command and Control*, 1 June 2007, 22.

³⁸*The American Heritage Dictionary*, 2nd edition (Boston, MA: Houghton Mifflin Company, 1991), 1109.

³⁹Air Force Doctrine, Annex 3-30, *Command and Control*, 1 June 2007, 96-98.

2009, the JFACC moved the Control and Reporting Center, responsible for controlling air operations over Afghanistan, out of the country in order to improve the C2 node's security (among other reasons as well). Information security affects a C2 system in the vertical dimension as well. Air Force doctrine states "security . . . must be incorporated into information system designs" to protect against a myriad of issues, which include hackers, corruption of data, unauthorized or unintended disclosure of data, and other threats to information operations.⁴⁰ A lack of trust among friendly partners can cause commanders to limit access to information in order to protect intelligence data. Limited information sharing results in stove piped operations in order to avert unauthorized access. When trust does exist, Brafman and Beckstrom note that information sharing throughout a system results in greater decentralization and actor empowerment.⁴¹

The second vertical force, *stability*, reflects a system "resistant to sudden change of position or condition," along with "consistency of character or purpose and reliability."⁴² There are many aspects of C2 that relate to stability, such as tempo, consistency in actors' participation, and the degree of trust among actors. With regard to tempo, the longer time between phase transitions and command relationships changes, the greater the trend towards integration. On average, when the supported commander remains the same during a long phase of an operation, the more established and integrated the force becomes. Additionally, when actors consistently participate in a C2 system, the effects of stability become more pronounced since there is time to train and adapt to the variety of social and cultural aspects that each additional actor/group brings with them.

⁴⁰Annex 3-30, *Command and Control*, 96-98.

⁴¹Brafman and Beckstrom, *The Starfish and the Spider*, 39.

⁴²*The American Heritage Dictionary*, 1185.

Trust among actors in the C2 system facilitates reliability and dependability, thus increasing stability as well. Trust is a major component of social and command relationships that when garnered, each echelon of command integrates more and engages in open discourse. This interaction reinforces a shared mental model, which is a critical aspect of any C2 system.⁴³ Building partnership capacity missions shape future stability in C2 systems. The more stable a pre-conflict environment, with the same actors working together over a significant amount of time, the more likely the required C2 system can exhibit integration and strengthen stability when a military operations commences.⁴⁴ The same effect occurs when any two organizations train and operate together, whether it is within a single service, cross service, or within a coalition.

Collectivity occurs when an object or organization is “formed by collecting or assembling [parts] into a whole;” it is also “the characteristic of individuals taking action as group.”⁴⁵ Collectivity is a function of cohesiveness in action and arrangement of forces. Stability might facilitate collectivity over time, but time is not necessarily required to build collectivity. If there is unity in action as a result of trust and actors perceive mutual benefit from working together to achieve the same or mutually reinforcing missions, collectivity typically increases. This idea is behind the concept of unified action within joint doctrine, defined as “the synchronization, coordination, and/or integration of the activities of governmental and non-governmental entities with military operations to achieve unity of effort.”⁴⁶

Additionally, the propensity for collectivity happens when elements of C2 systems have points of connection such as when elements are co-located geographically. Headquarters that

⁴³Army Doctrine Reference Publication (ADRP) 6-0, *Mission Command* (Washington DC: Department of the Army, 10 September 2012), 1-2.

⁴⁴Quadrennial Defense Review, *Building Partnership Capacity Execution Roadmap* (Washington DC: Deputy Secretary of Defense, 22 May 2006), 3-7.

⁴⁵*The American Heritage Dictionary*, 291.

⁴⁶Joint Publication 1-0, *Doctrine for the Armed Forces of the United States* (Washington DC: Joint Chiefs of Staff, 20 March 2011), GL-11.

bring command echelons together and facilitate trust and understanding, result in greater integration. In 1942, General Dwight Eisenhower strove to build trust and understanding in order to better achieve overall collectivity. When Eisenhower established the Allied Force Headquarters in preparation for Operation TORCH, he created the mechanism for collective action by co-locating coalition partners. The headquarters' intent was to ensure the "first Anglo-American offensive of the war would be a success and that in the process British and American officers would learn to work together."⁴⁷ Overall, collectivity is more about purpose and agreement for action, whereas uniformity—the next vertical force—is concerned with consistency of action and the ability to operate as one force.

Systems display *uniformity* when they remain "the same [and] unvarying" or are "without fluctuation . . . consistent."⁴⁸ Facets of the C2 system and operating environment that tend to strengthen uniformity include interoperability, laws and rules, and cultural proclivity. A system's uniformity often depends upon the degree to which elements of a C2 system can interoperate. For example, the ability for C2 systems to share information through interoperable messaging systems facilitates uniform integration. Additionally, when participants in a C2 system rely upon similar laws of war and rules of engagement, uniformity increases across the force and enables integration as a whole. When actors share a common view of the law and custom of war—such as those "set out in the Hague and Geneva Conventions"—and when war is permissible, collective action is strengthened.⁴⁹ Many traditional US allies resisted the US buildup and

⁴⁷Stephen E. Ambrose, *Eisenhower: Soldier and President* (New York, NY: Simon and Schuster, 1990), 76.

⁴⁸*The American Heritage Dictionary*, 1321.

⁴⁹David Fisher, *Morality and War: Can War be Just in the Twenty-First Century?* (Oxford: Oxford University Press, 2011), 65.

rationale for Operation IRAQI FREEDOM, due to differences over preemptive war.⁵⁰ At a more tactical level, when coalition partners operate with few or no national caveats to rules of engagement, C2 and military force employment is much more uniform across the battle space. In either case, shared cultural values tend to form norms about war, facilitating integration when there is a uniform point of view about war and rules of engagement.⁵¹ Shared culture can also bring about similar interpretations of what events or information mean within the context of war.⁵²

The final vertical force, *order*, is a “logical or comprehensible arrangement among separate element of a group; [the] condition of methodological . . . arrangement among parts, so that proper functioning is achieved.”⁵³ Key aspects that tend to produce order include a clear end state, clarity of authorities and roles, and the arrangement of C2 nodes. When the mission is clear with well-articulated goals and end states, the C2 system tends to coalesce into integrated order. Also, when the C2 structure clearly delineates roles and responsibilities to ensure no duplication and no overlap in authority, order and integration tend to emerge. Centralized organizations form roles, or functions, to help “support the weight of the organization.”⁵⁴ When assigning roles, commanders can use the concept of “multi-hatting” to produce order, but only if the arrangement aligns functions at the same level of war. If the multi-hatting crosses levels of war, disorder usually follows.⁵⁵

⁵⁰George C. Herring, *From Colony to Superpower: US Foreign Relations Since 1776* (Oxford: Oxford University Press, 2008), 949-950.

⁵¹Mary Jo Hatch, *Organization Theory: Modern, Symbolic, and Postmodern Perspectives*, 2nd ed. (Oxford: Oxford University Press, 2006), 186-187.

⁵²Gharajedaghi, *Systems Thinking*, 84-85.

⁵³*The American Heritage Dictionary*, 874.

⁵⁴Brafman and Beckstrom, *The Starfish and the Spider*, 48.

⁵⁵Air Force Doctrine, vol. I, *Basic Doctrine*, 132.

Horizontal Forces: Freedom, Change, Individuality, Uniqueness, and Complexity

The five horizontal forces—freedom, change, individuality, uniqueness, and complexity—inform a commander’s understanding regarding the degree of differentiation within the C2 system. As with vertical forces, the more the system exhibits characteristics of a particular horizontal force, there is a corresponding influence among other horizontal forces. Horizontal forces tend towards variety and intricacy and to reinforce one another. Following a similar format as with the vertical forces, examination of each horizontal force starts with a definition and includes general characteristics of the force in relation to doctrinal concepts about C2 systems.

The dictionary defines *freedom* as the “condition of being free from restrictions; [the] capacity to exercise choice; unrestricted use or access.”⁵⁶ In terms of access, freedom relates to the ability for C2 nodes to move unhindered within the operating environment and provide effects over the area of operations within the domains of land, air, space, and cyber. When there is access, elements of C2 may position forward in such a way as to bring a variety of effects not possible from rear echelons, such as when airborne elements of C2 execute real-time battle management over forward operating areas. Access allows a more localized, differentiated response. The Air Force’s model of contested, degraded, and operational limitations is useful in assessing this aspect of C2 freedom. Freedom diminishes the more an adversary challenges friendly C2 operations. In conjunction, the more C2 resources that can provide redundancy and resiliency, the less likely the system will experience degradation. In general, the less limitations that hamper air operations, the C2 system gains freedom to differentiate and empower lower-level C2 nodes. That empowerment provides commanders options to decentralize decision making in order to gain effectiveness when operating in complex environments.

⁵⁶*The American Heritage Dictionary*, 532.

Change is defined as “different; to go from one phase to another; to alternate with a person in performing a task.”⁵⁷ Simply stated, if the commander expects rapid phase transitions, the C2 system must be capable of dealing with greater differentiation and variety quickly. Change is not inherently negative, as it could aid the commander to achieve adaptation superiority over the adversary, as envisioned by Col John Boyd’s OODA loop.⁵⁸ Also, dispersal of command authorities to lower-level actors enables timely and effective reaction/direction for combat units when change occurs frequently in the operating environment.

Change is also characterized by the number of handoffs between commanders as the supported or supporting elements during execution. Remembering that trust was an issue regarding *stability* within command systems, a deficit of trust can result in frequent changes of C2 structures when participants pull out of a coalition, inducing disorder. A lack of trust among participants can cause frequent changes in the C2 system and throughout execution with participants attempting to exert undue control.

Individuality reflects a characteristic of “existing as a distinct entity” and being “distinguished by particular attributes.” It is also the ability to assert “one’s own will. . . and independence.”⁵⁹ Think of individuality as the number of actors unwilling to compromise differences in favor of group cohesion. This concept often manifests itself in terms of nations or other non-governmental agencies seeking to implement their own plans or to remain distinct from others. Two quick examples come to mind. In 1943, as General Eisenhower worked to build cohesion among the Allies in preparation for the Normandy invasion, French leadership remained insistent on individualism to the point that a few days before D-Day, Eisenhower was still

⁵⁷*The American Heritage Dictionary*, 258.

⁵⁸OODA stands for Observe, Orient, Decide and Act. Frans P.B. Osinga, *Science, Strategy, and War: The Strategic Theory of John Boyd* (New York, NY: Routledge, 2007), 230-232.

⁵⁹*The American Heritage Dictionary*, 656.

frustrated over the inability to build real unity with the French.⁶⁰ Another more modern example occurs during operations with non-governmental organizations. There are many mutual benefits to working together, yet non-governmental organizations often strive to remain unencumbered and detached from military coordination to avoid the appearance of collusion. In both examples, *individuality* often manifests as ‘seams’ within the C2 system.

When commanders cannot break apart or rearrange a unit or node within the C2 system due to the desire of a unit to remain indivisible as an individual unit, there is a high degree of differentiation and intricacy introduced into the C2 system. Any number of inter-service rivalries comes to mind; however, a common issue airpower commanders deal with revolves around USMC resistance to JFACC control of Marine aircraft as a going-in rule. The USMC seeks to maintain the indivisible character of their assets due to the nature of how, where, and why they fight.⁶¹ That being the case, the C2 system must engender greater aspects of differentiation to accommodate employment of the joint force. Individuality is not always a negative though, as original thoughts, ideas, and approaches to operations provide a commander with variety and originality from diverse views. This can ensure a degree of ‘unpredictability’ from the perspective of the enemy and give friendly forces a advantage in battle.

Uniqueness refers to something that is “one of a kind, without equal or equivalent.”⁶² When C2 nodes, elements, or combat systems cannot function along side or within established methods and procedures due to unique software or hardware, differentiation amongst the units increases. Additionally, differentiation due to unique capabilities introduces greater variety in capabilities from which a commander can employ, but the commander must build C2 structures to provide effective coordination and direction across disparate capabilities. Given the cross-

⁶⁰Ambrose, *Eisenhower*, 135.

⁶¹Joint Publication 1-0, *Doctrine for the Armed Forces*, IV-4.

⁶²*The American Heritage Dictionary*, 1322.

domain nature of airpower and the ever-growing importance of the cyber domain, every effect a commander can employ in a unique domain requires specialization within and across the domains. Management, coordination, and networking of the disparate domains brings C2 challenges of its own, but the more domains or services participating in an operation, the greater the variety of capabilities and effects the commander can use to fight an adversary, matching strengths against enemy weaknesses.

The final force, *complexity*, describes the degree that the C2 system or environment “consists of interconnected or interwoven parts.”⁶³ While the previous force, uniqueness, can make C2 designs challenging, it is the nature of the interactions that make it complex. If commanders organize the interaction among several different, unique, or individual actors in a way that simply requires coordination and deconfliction, the C2 system remains complicated, but not complex. In Vietnam, the route packages developed to deconflict Air Force and Navy missions reflect this thinking, where the coordination was complicated, but not complex in that Air Force and Navy planes rarely had to operate in the same airspace or for the same commander.⁶⁴ Airpower historian Dr. Mark Clodfelter observed that the complicated command relationships to make the route packaging work actually “produced chaos” due to “the absence of a single air commander.” The Gulf War in 1991 rectified this situation, simplifying command relationships and control of airpower vested in a single JFACC; however, the employment of airpower became truly complex as a result of the ‘interwoven’ air assets operating in a massive joint airspace.⁶⁵

⁶³*The American Heritage Dictionary*, 302.

⁶⁴Clodfelter, *The Limits of Air Power*, 129.

⁶⁵“The Air Tasking Order became a lightning rod for inter-service controversy” at first; however, it eventually became the tool General Horner used to gain the resources needed and to coordinate the strategic-to-task planning that drove targeting across all airpower assets operating over Iraq. Mann, *Thunder and Lightning*, 59-60.

Commander's should also consider the amount of complexity in or exhibited by the enemy's C2 system, as it might provide insight into the way the commander should organize friendly C2. Brafman and Beckstrom argue, "when attacked, a decentralized organization tends to become even more open and decentralized," while "centralized organizations tend to become even more centralized."⁶⁶ Accepting these general truths, the commander can anticipate how the adversary will react based on the nature of its C2 system; the commander can then anticipate what form friendly C2 systems should exhibit and then adapt as required. Likewise, by contemplating all ten vertical and horizontal forces, the commander stands to gain a deeper, more thorough understanding of the forces acting upon and shaping friendly C2 systems. However, it is not enough to simply identify the forces. Tension exists between all the vertical and horizontal forces, and the impact of that tension can expand the commander's cognitive understanding overall.

Vertical And Horizontal Tension

Applying any of the vertical or horizontal forces in isolation from one another reflects a linear, reductionist approach that lacks explanatory power. Instead, commanders should engage the vertical and horizontal forces as dualities, ever in tension with one another. According to Gharajedaghi, the vertical and horizontal forces form pairs of competing tension: security-freedom, stability-change, collectivity-individuality, uniformity-uniqueness, and order-complexity.⁶⁷

"Depending on the characteristics of a given culture, a social system," such as C2, a system moves towards a state of integration or differentiation with tradeoffs often occurring

⁶⁶Brafman and Beckstrom, *The Starfish and the Spider*, 21 and 139.

⁶⁷Gharajedaghi, *Systems Thinking*, 96.

between the vertical and horizontal forces.⁶⁸ Since there are five pairs of vertical-horizontal forces, it is rare for a system to exhibit *solely* vertical or horizontal features, though one dimension or the other may exert a much stronger influence. Theoretically, there is a point in every system that when horizontal forces fall below a certain level of vertical integration, the system devolves into chaos. An airpower example of this phenomenon can occur during tactical level execution when a lack of vertical integration during time-sensitive targeting scenarios results in what is colloquially termed “roving-motor cycle gangs” of 1- and 2-ship formations without clear coordination of effort. The opposite is true as well. There exists a point that when vertical forces lose a particular degree of horizontal differentiation, the system becomes ineffective. One example of this occurred within the former Soviet Union, where airpower C2 relied on strictly controlled intercepts from the ground, stifling pilot freedom and initiative. If the characterization of a C2 systems falls completely to the vertical or horizontal direction, it is often detrimental. While this is sometimes necessary, the most effective sociocultural systems exhibit characteristics of both vertical and horizontal forces.⁶⁹

The amount of qualitative tension between forces determines the strength of pull in one direction or the other. Conceptually, the subjective, qualitative measurement of a force ranges from ‘very significant’ to ‘very limited,’ and the pairings provide a way to think through the tension within the system. To determine if this conceptual framework of vertical-horizontal tension offers greater understanding, a historical case study provides a test bed from which to analyze a C2 system during airpower operations.

⁶⁸Gharajedaghi, *Systems Thinking*, 92.

⁶⁹Ibid., 93.

The Air Force is on trial in Korea.⁷⁰

- General Hoyt S. Vandenberg

AIRPOWER COMMAND AND CONTROL IN THE KOREAN WAR

Overview of the War and Command Relationships

When the North Korean Peoples Army (NKPA) crossed into South Korea early on 25 June 1950, the event surprised the United States and Western leaders.⁷¹ The handful of US Korean Military Advisor Group members that remained in Korea informed the Far East Command (FEC) of the Communist incursion, and in less than twenty-four hours, the Far East Air Force (FEAF) launched the first C-54s to start non-combatant evacuations.⁷² Immediately following the NKPA attack, General Douglas MacArthur tasked the FEAF with blocking the Communist advance until ground troops could move onto the Korean Peninsula. Operating out of Japan, 5AF initially provided only limited effects since the command possessed very few long-range bombers. The 5AF's medium-range bombers and fighters could loiter for just a short time over Korea due to the long distances flying from Japan. As the ground war stabilized and the Air Force established airbases within South Korea, these problems abated, and airpower played a significant role for the remainder of the conflict. This was just the beginning. For the next four years, the FEAF employed every aspect of airpower including strategic attack, counter air, interdiction, close air support, reconnaissance, and airlift.⁷³ Executing joint air C2 caused serious tension across the services throughout the war, as the Navy, Army, and Marine Corps grappled

⁷⁰Robert F. Futrell, *The United States Air Force in Korea 1950-1953*, rev ed. (Washington DC: Office of Air Force History, 1983), 689.

⁷¹David R. Mets, *A Companion for Aspiring Air Warriors: A Handbook for Personal Professional Study* (Maxwell AFB, AL: Air University Press, May 2010), 89.

⁷²Futrell, *The United States Air Force in Korea*, 5-7.

⁷³Alan Stephens, "The Air War in Korea, 1950-1953," in *A History of Air Warfare*, ed. John Andreas Olsen (Washington DC: Potomac Books, Inc., 2010), 85.

with an independent Air Force seeking to synergize all aspects of the employment of US and coalition airpower.

Hostilities during the Korean War occurred in distinct phases. From June through September 1950, the NKPA advanced to the Pusan perimeter where United Nation (UN) forces halted the North Korean attack. From October 1950 until April 1951, UN forces regained the initiative, pushing the NKPA to the North Korean-Chinese border formed by the Yalu River. Starting in April 1951, the Chinese Army joined forces with the NKPA and forced the retreat of UN forces back to just south of the 38th parallel by June that year. In the summer of 1951, the UN and North Korea entered into negotiations, and for the next three years both sides attempted to use coercive methods and the threat of future action to gain advantage during negotiations.

The Korean War was the first test not only for the newly independent Air Force, but the United States' recent unified military configuration.⁷⁴ The war was the first conflict America fought following the 1947 National Security Act, which established the Department of Defense and the Air Force as a separate military branch.⁷⁵ At the time, Army personnel and doctrine dominated Far East Command (FEC), led by General MacArthur. In fact, when the new Joint Chiefs of Staff ordered all US theater commands to stand up a joint headquarters in 1947, MacArthur only complied under pressure three years after the order. Even then, the limited joint organization he created was weak, and it was subordinate to his General Headquarters (GHQ)—the 'joint' organization was comprised of less than a handful of USAF and Navy officers and lacked the manpower needed to exert any real influence.⁷⁶ Besides MacArthur's challenge of

⁷⁴Futrell, *The United States Air Force in Korea*, 693.

⁷⁵Herman S. Wolk, "The Quest for Independence," in *Winged Shield, Winged Sword: A History of the United States Air Force*, ed. Bernard C. Nalty (Washington DC: Air Force History and Museums Program, 1997), 1:395.

⁷⁶Futrell, *The United States Air Force in Korea*, 44.

building a joint C2 structure—which he seemed less than enthusiastic about—he had other trials as the leader of a growing coalition.

MacArthur simultaneously led a large coalition as the Commander, United Nations Command (UNC), which included British, Australian, South African, Greek, and South Korean air forces. The United States' air component, the Far East Air Forces, led by General George E. Stratemeyer, contributed the preponderance of airpower during the war. Fifth Air Force (5AF), a subordinate command to FEAF, was responsible for Japanese and Korean areas of operation. MacArthur and Stratemeyer placed the headquarters of FEC, FEAF, and 5AF together in Japan; furthermore, 5AF maintained a fairly robust air defense network of radars and fighter aircraft throughout Japan. Yet, without a combat mission for Korea, 5AF had little incentive to plan for a Korean crisis.⁷⁷ The lack of focus on Korea by 5AF is hardly a surprise, given the equal negligence by the Department of Defense, State Department, and the President.⁷⁸ In short, the FEC and FEAF occupied Japan, focusing on the defense and internal stability of the island nation, as opposed to any kind of offensive capability against other potential regional adversaries.

Not only was the Air Force as a separate service tested by operations over Korea, but the USAF fought for a very different strategic objective than in WWII—Korea was a limited war. The United States was concerned with the geopolitics of containment, wary of escalation, and as Conrad Crane notes, the threat of a nuclear exchange was ever present.⁷⁹ At the start of the war, the Air Force as an institution was dedicated to bomber-delivered nuclear weapons as a result of America's massive post-WWII military drawdown; since then, the USAF was given the primary

⁷⁷Futrell, *The United States Air Force in Korea*, 24.

⁷⁸In fact, Secretary of State Dean Acheson failed to include North Korea and Taiwan in the US security zone during a major press briefing in early 1950. T.R. Fehrenbach, *This Kind of War* (Washington DC: Brassey's, 1963), 32.

⁷⁹Conrad C. Crane, *American Airpower Strategy in Korea 1950-1953* (Lawrence, KS: Kansas University Press, 2000), 8.

mission of containing the Soviet Union through the threat of nuclear retaliation.⁸⁰ Therefore, nuclear escalation was a significant concern for the United States during the Korea War, and the USAF saw close air support missions as important, but secondary at best. Strategic Air Command's long-range bombers could reach most of the Soviet Union, but Washington's concerns over possible adversary miscalculation caused the President to restrict targets in Manchuria and Russia as off-limits throughout the conflict. Korean War historian Robert Futrell remarked that the USAF needed to determine new ways of coercing the enemy given that the adversary's war-making potential remained outside North Korea and off limits to US bombers.⁸¹ Yet, even within North Korea, the United States placed restrictions on strikes against industrial and civilian targets for a variety of reasons including Chinese linkages and world opinion.

Hitting targets proved difficult for other reasons. Korea's terrain posed serious problems for 5AF. Targeting and reconnaissance was hampered due to towering, sharp mountains and a gray-green canopy that merged together. A lack of serviceable airfields, poor terrain for radar and reconnaissance, and poor visibility caused by misty summers and wintry weather hampered operations as well. And although North Korea had only a small air force, the North's anti-aircraft artillery was robust and effective. In the midst of these conditions, 5AF conducted air operations in an attempt to force North Korean capitulation.⁸²

The 5AF conducted major air campaigns over three distinct periods, each with unique operational objectives. The first major period from June 1950 until July 1951 was a wide-ranging effort balancing close air support, interdiction, and airlift. Before the introduction of Chinese

⁸⁰Wayne Thompson, "The Air War over Korea," in *Winged Shield, Winged Sword: A History of the United States Air Force*, edited by Bernard C. Nalty (Washington DC: Air Force History and Museums Program, 1997), 2:52.

⁸¹Futrell, *The United States Air Force in Korea*, 24.

⁸²Fehrenbach, *This Kind of War*, 114.

Stephens, "The Air War in Korea," 89.

manpower and material directly in 1951, the NKPA operated as a fairly closed system, and UN air and ground operations worked in concert to defeat the adversary's military once the UN army was capable of conducting offensive operations. Aggressive UN ground activity forced the NKPA to continuously use its war making material while airpower slowed enemy arms flow to the front lines. North Korea was forced to use its resources faster than it could replenish them. 5AF, the Navy's Task Force 77, and the USMC achieved this by executing close air support while attacking targets of opportunity within about sixty miles of the battlefield. When the battlefield stabilized in the summer of 1951 and armistice negotiations set to start, 5AF put together a new air campaign.⁸³

The second air campaign period, from August 1951 until June of 1952, made attempts to choke the North Korean military through operational and strategic interdiction methods during what was called Operation STRANGLE.⁸⁴ For this operation, 5AF conducted a more deliberate and methodical operation than the previous effort. The aim was to cut the railroads and bridges to prevent the flow of material now pouring in from China.⁸⁵ However, once Chinese forces started openly aiding the North Korean war-making machine in March 1951, the NKPA became more like an open system and interdiction never seemed to make the desired impact needed to coerce the North Koreans towards a negotiated settlement. Part of the reason for airpower failure included the fact that the enemy repaired rail and road disruptions in a timely fashion while switching tactics to delivering material to the front. Also, the lack of a simultaneous and continuous UN ground campaign enabled the adversary to use supplies only when desired.⁸⁶

⁸³Robert A. Pape, *Bombing to Win: Air Power and Coercion in War* (Ithaca, NY: Cornell University Press, 1996), 146-149.

⁸⁴*Ibid.*, 148-149.

⁸⁵Crane, *American Airpower Strategy in Korea*, 82.

⁸⁶Pape, *Bombing to Win*, 150.

Finally, following the poor results of STRANGLE, air planners developed a concept known as “Air Pressure” aimed at inflicting punishment across the North Korean nation starting in the summer of 1952.⁸⁷ The United States lifted restrictions against industrial targets, and 5AF struck hydroelectric plants, dams, irrigation systems, and even population centers. The FEAF combined psychological operations with these strikes, but then had to back off at the request of the State Department for fear of playing into Communist propaganda. Yet, these operations had a coalescing effect for friendly forces, as greater numbers of coalition aircraft participated in the nation-wide efforts. Air Pressure continued until early 1953 when targets literally dried up. The campaign appeared to have some degree of success at the operational level, but there was limited evidence that Air Pressure was making a strategic impact. The enemy seemed eager to renew cease-fire arrangements based on the air campaign, but negotiations continued on for several more months due to disagreements over prisoner of war exchanges.⁸⁸

Vertical-Horizontal Tension During the Korean War

Security and Freedom. As of 25 June 1950, 5AF did not maintain any C2 apparatus outside of Japan, and North Korea could not threaten it. Recognizing the immediate need for an air-ground combined mission to aid the impending Army surge into Korea, the initial commander of FEAF during the war, Major General Earle E. Partridge, ordered his deputy commander for operations to create the a 5AF (Advanced) command echelon at Itazuke, Japan. This location placed the tactical-level airpower C2 node on the Japanese island of Kyushu, close to the Korean peninsula. The advanced echelon moved to Taejon, South Korea in early July to form a joint

⁸⁷Pape, *Bombing to Win*, 151.

⁸⁸Crane, *American Airpower Strategy in Korea*, 123-131.

Pape, *Bombing to Win*, 157-167.

operations center (JOC) with the army component element, 8th Army, at the tactical level.⁸⁹

When North Korean ground forces threatened the JOC a week later, the US pulled the JOC back to Pusan, where it remained until after UN forces pushed the NKPA back over the 38th parallel at the end of the year.

The 5AF established localized air superiority over Korea quickly by mid July, ensuring the physical security of the JOC from air. The effective defense of the Pusan perimeter, and later the 38th parallel, established the JOC's physical security.⁹⁰ Furthermore, the *freedom* of the 5AF (Advanced) echelon remained tied to the conditions on the ground, but once negotiations started in the summer of 1951, the JOC remained fixed in Seoul. With physical security and freedom assured, 5AF moved air defense radar, warning, and control units into Korea to facilitate airpower C2.⁹¹ Later in the war, North Korean PO-2 aircraft attempted ineffective raids—known as “Bedcheck Charlies”—against radar and control center nodes on the island of Cho-do.⁹²

Additionally, information security was not a major problem for the coalition since a lot of data was readily shared with trusted coalition partners and that the fact that North Koreans (and later the Chinese) had little capability to intercept or hinder communication flow. Of course, there were still times that data classification trumped any liberal data-sharing practices. In fact, FEAF would not share specific signal intelligence obtained against the Communist forces with its subordinate command, 5AF, due to concerns over the sensitive nature of the information.⁹³ While information security internal to the USAF organization prevented information flow at times, this

⁸⁹Futrell, *The United States Air Force in Korea*, 78.

⁹⁰Carroll V. Glines, *The Compact History of the United States Air Force* (New York, NY: Hawthorn Books, Inc., 1963), 302.

⁹¹The 5AF headquarters moved from Taejon, to Pusan, to Taegu, and eventually to Seoul during the course of the war. Futrell, *The United States Air Force in Korea*, 658-666.

⁹²*Ibid.*, 695.

⁹³Eduard Mark, *Aerial Interdiction in Three Wars* (Washington DC: Center for Air Force History, 1994), 277.

issue did not seem prevalent during the conflict as only one of the many Korean War accounts examined ever mentions this issue. Also, Communist jamming occasionally affected the tactical air request net used to coordinate on-call close air support, making it undependable at times.⁹⁴ Thus, UN forces generally could rely upon the integrity and completeness of information shared among coalition forces, with disruptions from time to time due to jamming. Overall, the quality of the security-freedom tension seemed relatively balanced at first, but shifted in strength to the horizontal force after the summer of 1951. Few significant issues impacted security, and airpower C2 enjoyed a large degree of freedom.

Stability and Change. The tension between these two forces ebbed and flowed during the war, resulting in the need for constant revision of the C2 system. At first, *change* significantly characterized operations, the environment, and the C2 relationships. Operationally, the situation on the ground fluctuated across the entire 575-mile long peninsula over the course of a year.⁹⁵ Leadership could take nothing for granted during that time. What did remain stable was the overall operational to tactical C2 construct—UNC, FEAF, 5AF, and the JOC all remained as originally employed. Within each echelon, the leadership tinkered with the C2 relationships, but these major command elements remained fixed.

The commanders themselves changed frequently over the four-year war, with most command echelons rotating out almost every year—sometimes leaders would move up the chain, but not always. For instance, UNC went through a radical shakeup when President Truman fired MacArthur in April 1951. General Matthew Ridgeway took command for two years, and then handed over UN command to General Mark W. Clark in 1953. 5AF went through four commanders, and the FEAF Bomber Command operating B-29s from Strategic Air Command

⁹⁴Futrell, *The United States Air Force in Korea*, 462.

⁹⁵Pape, *Bombing to Win*, 147.

went through seven commanders in four years.⁹⁶ The only relatively stability for a command was FEAF. When Weyland took over from Partidge in June 1951, Weyland remained in place for the duration of the war. As for coalition forces, the major participants never changed, and remained folded into the command structure with the US as the lead nation. Greece and Thailand contributed mobility air forces, with Britain, Australia, and South Africa contributing combat fighters or attack aircraft.⁹⁷

Another way things changed included the fact that 5AF consistently launched new operations, each with different goals and defeat mechanisms. From 1951 to 1954, airpower went through several cycles of generating and conducting new operations. This altered the tempo of the conflict and induced constant reframing for decision makers. This resulted in various and changing degrees of control required. Adapting operational and innovative approaches are normally a positive phenomenon; however, the move from STRANGLE to Air Pressure forced operational-level commanders to develop new methods of planning while they experimented with new control mechanisms such as prescribed routing and timings.⁹⁸ Overall, the amount of change throughout the operation was significant; however, stability at key C2 nodes enabled FEAF and 5AF to function in lieu of the constant shifts in operations and commanders.

Collectivity and Individuality. Collectivity and individuality both strongly characterized the C2 system with a high degree of tension between the two forces. Early on in the war, *collectivity* really only existed at the position of the UNC commander, and even then it was mostly in concept only.⁹⁹ Despite JOC successes at the tactical level, the UNC functioned absent any real joint headquarters of consequence at the operational level for over two years after the

⁹⁶For a complete listing of all FEAF and subordinate unit commanders, see the Appendix in Futrell, *The United States Air Force in Korea*, 773.

⁹⁷Ibid., 462.

⁹⁸Crane, *American Airpower Strategy in Korea*, 114-122.

⁹⁹Stephens, *The Air War in Korea*, 89.

war began.¹⁰⁰ One of the few successes that FEAF achieved towards building collective execution occurred when it got approval from MacArthur to temporarily create the FEC Targeting Board. Initially, MacArthur's GHQ attempted to direct air strategy and targeting, which Partridge strongly resisted as FEAF commander. FEAF proposed the FEC Targeting Board vet and produce a joint targeting list from all the service's inputs, including GHQ's recommendations. Within a few weeks, the effectiveness of the FEC Targeting Board convinced MacArthur of FEAF planning efficacy, and the GHQ targeting board disbanded.¹⁰¹

A less successful attempt at collectivity occurred early in July 1950, when the Navy staunchly clung to individual differentiation and sought to maintain their air assets exclusively. The most naval leadership would concede to 5AF was coordination of effort. In reality, coordination authority meant very little and had no doctrinal definition, leaving the JOC at the UNC level with no consensus from which to operate. It also left FEAF and 5AF with no real authority when it came to orchestrating air operations across services.¹⁰² By 1951, when Weyland took over FEAF, he spent as much effort quarrelling with the Navy as he did the enemy; in fact, FEAF spent forty percent of its effort countering Army, and to a lesser degree Navy, attempts to direct airpower employment.¹⁰³

Additionally, when it came to actually operating together over Korea, the services fared no better in collective effort or unity of command for air operations. As early as three weeks into the conflict, 5AF and its naval counterpart ceased efforts to integrate airpower, and the 5AF commander stopped any attempt to conduct coordination with the Navy. Instead 5AF agreed that

¹⁰⁰Futrell, *The United States Air Force in Korea*, 693.

¹⁰¹Ibid., 52-55.

¹⁰²Ibid., 50.

¹⁰³Crane, *American Airpower Strategy in Korea*, 7.

the Navy would ‘own’ a portion of airspace and left it at that.¹⁰⁴ The Navy’s carriers, Task Force 77, took over all operations and planning for attacks against North Korea in the three northeastern-most sectors along the coast.¹⁰⁵ The 5AF and the other services rarely operated together from that point forward until the last year of the war. Individuality reigned with regard to USMC assets as well, as the Marines rebuffed requests to place their aircraft in the available air asset pool.¹⁰⁶ In the end, 5AF achieved only limited coordination at best with other services; even then, such ‘coordination’ was often only accomplished through deconfliction and not true integration.

Not all 5AF efforts at collectivity were hampered by service individuality tendencies; advances transpired at the lower tactical level of airpower C2. These happened mostly in the 5AF and 8th Army JOC in Korea. Fifth Air Force stood up a Tactical Air Coordination Center within the JOC for conducting allocation and coordination of air assets for close attack. The Navy participated regularly for planning purposes, but coordination with the Tactical Air Control Parties in the field was difficult for a variety of reasons highlighted in the next tension pairing.

UNC achieved breakthroughs in collective action late in the war in 1953 when naval fighters escorted 5AF bombers during an air attack deep into North Korea. Task Force 77 aircraft provided protection for the bombers against the MiG-15s operating out of the Manchurian sanctuaries.¹⁰⁷ Despite these partial successes, it is evident that the qualitative pull of *individuality* was ever present in the C2 system for air operations.

Uniformity and Uniqueness. The fourth tension pairing played a less significant role during the war in shaping C2 execution. In almost its entirety, the coalition was Western and had

¹⁰⁴Crane, *American Airpower Strategy in Korea*, 28.

¹⁰⁵Mark, *Aerial Interdiction in Three Wars*, 294-297.

¹⁰⁶Crane, *American Airpower Strategy in Korea*, 183.

¹⁰⁷*Ibid.*, 156.

bonded through common experiences during WWII. The handful of non-Western participants were so few in number and integrated into the command structure as to not affect operations to a marked degree. One example where a unique capability impacted C2 employment was the limitations of the Australian Meteor aircraft. The Meteors could not compete against MiG-15s, and the FEAF had to employ the squadron in niche areas that remained safe from attack.¹⁰⁸ More troublesome was unique US Navy and Marine aviation capabilities that impacted C2 arrangements as well. As mentioned earlier, the Tactical Air Control Parties had difficulty coordinating with naval assets due to the Navy's differences in terminology; additionally, different radio sets and frequency capabilities prevented integration and coordination. This problem contributed to the establishment of service-specific sectors.¹⁰⁹

One example where *uniformity* exerted strong influence came when General Ridgeway considered expanding the rules of engagement for aircraft in hot pursuit along the Yalu River and allowing strikes against adversary air bases in Manchuria. Coalition members disagreed so strongly out of concern for world opinion and the impact to UN support, Ridgeway did not go forward with the policies.¹¹⁰ He could have made US pilots unique from other partners giving them nation-specific caveats, but the UN would have lost uniformity politically and militarily. In the end, the equilibrium remained strong between uniformity and uniqueness; if anything, there was a slightly greater pull coming from the vertical force.

Order and Complexity. Finally, the last tension pair, order and complexity, tended heavily towards the horizontal force throughout most of the war. The lack of a clear political and military end state hindered order and added complexity to an already challenging environment. Without a clear end state, there was little hope for order within the operation and among the

¹⁰⁸Futrell, *The United States Air Force in Korea*, 651.

¹⁰⁹Crane, *American Airpower Strategy in Korea*, 28.

¹¹⁰*Ibid.*, 85.

different services. This increased complexity across the board, as each service planned and executed operations as each saw fit.¹¹¹ More often than not, the services took action that engendered parochial thinking and played to those services' strengths.

Many times *order* appeared evident within the FEAF itself, but was often elusive. Partridge attempted to provide clear priorities for air operations, including air superiority, close attack, and interdiction. Unfortunately, because the JOC at GHQ lacked real influence, GHQ tried to subvert and change 5AF guidance to subordinate commands. For instance, the commander of Army forces in Korea, General Edward M. Almond, kept demanding more close air support. To support Almond, GHQ attempted to override 5AF guidance regarding the use of bombers slated for strategic attack and interdiction. At the tactical level, order was only seemingly achieved due to the mostly deconflicted and segregated nature of airpower employment. There was almost no tension within this pairing, as *order* seemed to affect the C2 system very little. In fact, *complexity* and disorder were so great that according to official Air Force history, the "fantastically confused command system in the Far East" was to blame for the "inability to bring 'the full force of air power' to bear" against North Korea.¹¹²

In sum, the C2 system used for air operations over Korea had a significant horizontal influence that resulted in a fairly differentiated C2 system of employment, informing us today of positive and negative aspects of that system. Without having used the vertical-horizontal framework to examine the exact nature and describe how the C2 systems really worked, it would be difficult to expose these characteristics of the C2 system. Assessing the C2 system from only a perspective of centralized versus decentralized decision making would expose just one facet of the C2 system. The process of walking through the ten forces evaluating aspects of integration

¹¹¹Crane, *American Airpower Strategy in Korea*, 95.

¹¹²Stephens, *The Air War in Korea*, 89.

and differentiation—vertical and horizontal forces—achieves a more holistic and thorough understanding that does not depend as greatly on commander experience, supplementary questions, or other means. The vertical-horizontal cognitive framework does not negate the need to determine decision criteria and placement of decision authority; however, it does provide a more methodical and systemic appraisal tool that gives commanders better understanding overall. Through the process of applying the framework to the Korean War case study, some key lessons emerge regarding framework application, the nature of C2 systems, and what that means for the future of Air Force C2.

ANALYSIS OF THE FRAMEWORK

Additional Observations Regarding the Tension Pairings

Each tension pairing used to analyze the Korea War had a vertical and a horizontal component. In every case, there was a qualitative presence of both the vertical and the horizontal force, that although one force at times exerted a strong pull within its own dimension, the tension pairing was not a zero-sum condition. For example, in the stability-change tension pair, a significant degree of stability developed after the first year, allowing the C2 apparatus to gain stability. Yet, a significant amount of change remained in the C2 system as commanders switched out regularly. Other pairings such as *uniformity-uniqueness*, had a strong pull in the horizontal dimension, but very little in the vertical.

Besides having a qualitative presence of both vertical and horizontal forces within one pairing, a force's relative strength could also shift over time. For example, in the third pairing, the *individuality* force remained strong throughout the war. In the last year of the war, the vertical force, *collectivity*, gained influence moving from what was little strength to greater strength as a result of increased cooperation among naval and air force commanders. Yet, individuality did not concurrently lessen.

Additionally, there was evidence that the qualitative strength of a force in one dimension (vertical or horizontal) impacted the qualitative strength of other forces in the same dimension. In the case of Korea, all five tension pairings had strong horizontal forces, with each one reinforcing other horizontal forces in other tension pairs. Also, as a vertical force gained strength, more followed in roughly the same time period, though the degree of lag is unknown. When the vertical force of *security* increased due to “Bedcheck Charlie” attacks and the presence of the MiG-15s from China, *collectivity* tended to grow in strength as well, with navy and air force assets working closer together.

Using the Framework in the Future—What Does it Mean?

There are three major lessons that emerge regarding how C2 systems work when considering today’s environment after applying the vertical-horizontal cognitive framework. First, C2 systems require a balanced presence of both vertical and horizontal aspects to achieve effectiveness. A significant imbalance in the tension pairs hindered effective airpower C2. Second, the interaction among the members is more critical to success than overall interoperability. Third, C2 systems naturally tend towards differentiation, and commanders will find it more challenging and difficult to create effective C2 integration without inadvertently sacrificing key aspects of differentiation.

The first lesson indicates that an imbalance within the vertical-horizontal dimensions for a C2 system detracts from overall effectiveness. Imbalances within the pairings were detrimental. A system dominated by either vertical or horizontal forces might work under very particular conditions; however, military operations tend to benefit when a C2 system exhibits strong balance within each tension pairing. When commander’s purposefully choose to design a C2 system based wholly on vertical forces while at the same time diminishing the corresponding horizontal forces, that C2 system is highly organized, yet can only operate in the most simplistic manner and environment. The opposite phenomenon is also true. A fully horizontally characterized C2

system executes in a rather chaotic-appearing manner, but operates in a complex way and does well in a complex environment. Neither of these two extreme systems benefits military application in any but the most extreme circumstances. For example, a highly vertical C2 system is very organized and simple, a requirement for nuclear operations which must work the same way every time under tight control. There is no room for differentiation. Gharajedaghi explains that one way commanders could creatively achieve balance in the tension pairing is by instituting certain processes. For instance the process of participation solves tension between freedom and security, adaptations bring about simultaneous stability and change, and clear, detailed organization can help balance order and complexity.¹¹³

Second, “the level of integration and development that an organization will achieve depends on the means by which it deals with interaction among its members,” not interoperability.¹¹⁴ Interoperability definitely helps C2 systems work together, but the quality of interaction that develops trust and understanding can overcome interoperability issues. Even if interoperability is not an issue, deficiencies in trust and understanding often results in war fighters ignoring or marginalizing a particular C2 node or decision maker in the system. It could cause higher-level commanders to hold on to decision authority or seek technological solutions to minimize horizontal aspects of the system. This detracts from overall effectiveness, and can have the effect of creating imbalances in the tension pairs causing further inefficiencies and ineffectiveness in a sort of cascading way.

Finally, developing differentiation within a C2 system poses little challenge since social systems naturally trend towards differentiation.¹¹⁵ Military C2 systems are no different—tribes form, coalitions form, service parochialism dominates a discussion, etc. On the other hand, to

¹¹³Gharajedaghi, *Systems Thinking*, 95.

¹¹⁴Ibid.

¹¹⁵Ibid.

achieve integration, commanders, planners, and operators must possess strong skills in order to accomplish integrative effects. One of those skill sets includes an appreciation of the systemic nature of vertical and horizontal forces.¹¹⁶ Another is an ability to garner trust, understanding, and a common vision that induces people to embrace a greater degree of integration that might require some small sacrifices to differentiation in order to achieve balance within a particular tension pair. A prime example from the Korean War includes the fact that the various services' air arms entered the war highly differentiated, but towards the end of war, the services integrated to a much greater degree. What this also tells the Air Force is that there is a great incentive for commanders and decision makers within the C2 nodes to have strong knowledge, skills, and experience at building and operating C2 systems. Experts at C2 and battle management are indispensable when planning and executing air operations in order to achieve vertical and horizontal balances at all levels of command and employment.

Today's Air Force Command Philosophy

Centralization and decentralization should not characterize a C2 system alone, especially when the Air Force seeks an adaptable system appropriate for the 21st century. Rather, commanders should seek a balanced vertical and horizontal system. That balance should match efforts towards integration with equal emphasis on differentiation. Taking a cue from Major Ankerstar, the Air Force C2 philosophy need not rest on an outdated bumper sticker tenet that no longer captures everything that is important when it comes to airpower C2.¹¹⁷ The philosophy should emphasize integration in the vertical dimension while stressing equal balance in differentiated control mechanisms in the horizontal dimension. Airpower commanders should seek maximized integration and differentiation simultaneously.

¹¹⁶Gharajedaghi, *Systems Thinking*, 95.

¹¹⁷Ankerstar, "Beyond Centralized Control and Decentralized Execution," xlvii.

When developing this philosophy, the USAF must not lose the hard fought lessons of airpower unity and the flexibility that emerges from unity of command. Just like the USMC emphasizes maintaining control of its aircraft, the Air Force can and should guard the sanctity of unity of command among air assets, for the lessons of past conflict show the benefits of synergy across strategic to tactical employment for the nation. General Hostage and Colonel Hinote both alluded in their writings that something more was needed when it came to the master tenet, and their experience enabled them to overcome the innate limitations of the tenet. What they could not find in centralized control, decentralized execution alone, future commanders can discover through a vertical-horizontal approach to C2. This leads to a need to shift airpower C2 theory away from the single issue of centralization-decentralization, while not discounting the need for commanders to consider the decisional empowerment aspects required of the C2 system. If the Air Force still desires a bumper sticker, then that slogan should somehow capture the ideals of a unified, integrated approach that values differentiation and variety at the same time.

This may sound much like centralized control, decentralized execution, but the removal of the words centralized and decentralized is more than a happy-to-glad word change. It makes a difference in how a *joint* air component commander, or any commander for that matter, works with sister service air arms and for the joint forces commander directly. No longer would the tenet be power based, but rather information based and focused on meaningful social interactions that stress mission accomplishment. A focus on trust and understanding, as indicated in the second lesson observed in the previous section, becomes a lynch pin in achieving effective social interactions and maximizing vertical-horizontal balances in the C2 system. Yet the problem remains—how to ensure air assets do not end up in WWII-like penny packets or the airspace divided up into route packages such as in Vietnam. Therefore, the better way for JFACCs and subordinate commanders to approach C2 is through a model of *integrated command and distributed control*. Integrated command satisfies the vertical nature of C2 systems and

emphasizes the five integrative forces that aid a commander when thinking through the vertical facets of air C2. Likewise, distributed control addresses the horizontal facets and enables commanders to use the five horizontal forces to think through how to maximize differentiated aspects that can garner responsive, localized approaches throughout the chain of command.

The story of the United States Air Force is the story of the search for . . . innovation.¹¹⁸

—Admiral Mike Mullen

CONCLUSION

Commanders can use the vertical-horizontal cognitive framework as an effective method to analyze and adapt their C2 system for airpower employment. To do so, requires looking for ways to leverage and design C2 systems in such a way as to maximize the vertical, integrative dimension while at the same time maximize the horizontal, differentiating dimension. By leveraging the two force dimensions simultaneously, the commander can build a C2 system that becomes more adaptive. Additionally, as technology and social conditions change what C2 systems can do and how the environment works, the Air Force can take the lessons of the last forty years along with improved employment theories based on systems thinking to embrace a C2 philosophy that innovates beyond centralization-decentralization without discarding that valuable and necessary construct. Instead, *integrated command and distributed control* can help commanders and the Air Force achieve a more current and applicable way to approach and understand the command and control of air operations.

Returning to the events of 2009, did it matter if the JFACC thought in terms of centralized versus decentralized control? It likely did not hurt the conceptual approach, but that approach did not capture the full reality of the tensions within a C2 system, nor what makes a

¹¹⁸U.S. Department of the Air Force, *Global Vigilance*, i.

good C2 system today. The empowerment dilemma found in the centralized-decentralized approach is only one part of how to cognitively frame and design a C2 system. It is likely that General Hostage's experience and knowledge filled in the missing framework for Afghanistan operations, but future commanders can find value in thinking through a C2 problem using the vertical-horizontal framework.

BIBLIOGRAPHY

- Air Force Doctrine, Annex 3-30. *Command and Control*. Maxwell AFB, AL: Air Force Doctrine Center, 1 June 2007.
- Air Force Doctrine, Vol I. *Basic Doctrine*. Maxwell AFB, AL: Air Force Doctrine Center, October 2013.
- Air Force Doctrine, Vol III. *Command*. Maxwell AFB, AL: Air Force Doctrine Center, October 2013.
- Air Force Manual 1-2. *United States Air Force Basic Doctrine*. 1 April 1953.
- Alberts, Davis S. and Richard E. Hayes. *Power to the Edge: Command...Control...in the Information Age*. Washington DC: DoD Command and Control Research Program, 2003.
- Ambrose, Stephen E. *Eisenhower: Soldier and President*. New York, NY: Simon and Schuster, 1990.
- Ankerstar, Steven E. "Beyond Centralized Control and Decentralized Execution. Monograph, School of Advanced Air and Space Studies, Air University, 2005.
- Army Doctrine Reference Publication 6-0. *Mission Command*. Washington DC: Department of the Army, 10 September 2012.
- Atkinson, Simon Reay and James Moffat. *The Agile Organization: From Informal Networks to Complex Effects and Agility*. Washington DC: DoD Command and Control Research Program, 2005.
- Berkowitz, Bruce. *The New Face of War: How War Will Be Fought in the 21st Century*. New York: The Free Press, 2003.
- Beyerchen, Alan D. "Clausewitz, Nonlinearity, and the Unpredictability of War." *International Security* 17, no. 3 (Winter, 1992).
- Blomme, Mark E. "Decentralizing Centralized Control: Reorienting a Fundamental Tenet for Resilient Air Operations." Monograph, School of Advanced Military Studies, 2008.
- Bousquet, Antoine. *The Scientific Way of Warfare: Order and Chaos on the Battlefields of Modernity*. New York, NY: Columbia University Press, 2009.
- Brafman, Ori and Rod A. Bechstrom. *The Starfish and the Spider: The Unstoppable Power of Leaderless Organizations*. New York, NY: Portfolio, 2006.
- Clausewitz, Carl von. *On War*. Translated and edited by Michael Howard and Peter Paret. Princeton, NJ: Princeton University Press, 1976.
- Clodfelter, Mark. *The Limits of Air Power: The American Bombing of North Vietnam*. New York, NY: The Free Press, 1989.

- Cilluffo, Frank J. and Joseph R. Clark. "Thinking About Strategic Hybrid Threats—In Theory and in Practice." *PRISM* 4, no. 1 (2012): 47-63.
- Crane, Conrad C. *American Airpower Strategy in Korea 1950-1953*. Lawrence, KS: University Press of Kansas, 2000.
- Dörner, Dietrich. *The Logic of Failure*. New York, NY: Basic Books, 1996.
- Eisenhower, John S. D. *Intervention! The United States and the Mexican Revolution, 1913-1917*. New York, NY: W. W. Norton and Company, 1993.
- Fehrenbach, T.R. *This Kind of War*. Washington DC: Brassey's, 1963.
- Fisher, David. *Morality and War: Can War be Just in the Twenty-First Century?* Oxford: Oxford University Press, 2011.
- Futrell, Robert F. *The United States Air Force in Korea 1950-1953*. Rev ed. Washington DC: Office of Air Force History, United States Air Force, 1983.
- Gaddis, John Lewis. *The Landscape of History*. London: Oxford University Press, 2002.
- Gharajedaghi, Jamshid. *Systems Thinking: Managing Chaos and Complexity: A Platform for Designing Business Architecture*. 2nd ed. New York, NY: Elsevier, 2006.
- Gerber, David K. "Adaptive Command and Control of Theater Airpower." Monograph, School of Advanced Airpower Studies.
http://www.au.af.mil/au/aupress/digital/pdf/paper/t_gerber_adaptive_command.pdf.
- Glines, Carroll V. *The Compact History of the United States Air Force*. New York, NY: Hawthorn Books, Inc., 1963.
- Hatch, Mary Jo. *Organization Theory: Modern, Symbolic, and Postmodern Perspectives*, 2nd ed. Oxford: Oxford University Press, 2006.
- Herring, George C. *From Colony to Superpower: US Foreign Relations since 1776*. Oxford: Oxford University Press, 2008.
- Hinote, Clint. "Centralized Control and Decentralized Execution: A Catchphrase in Crisis?" Research paper 2009-1, Maxwell AFB, AL: Air Force Research Institute.
- Howard, Michael. *War in European History*. New York, NY: Oxford University Press, 2009.
- Hostage, Mike. "A Seat at the Table: Beyond the Air Component Coordination Element." *Air & Space Power Journal* (Winter 2010):18-20.
- Hukill, Jeffery. *Air Force Command and Control: The Need for Increased Adaptability*. Maxwell AFB, AL: Air Force Research Institute, 2012.
- Joint Publication 1-0. *Doctrine for the Armed Forces of the United States*. Washington DC: US Government Printing Office, 20 March 2011.

- Joint Publication 3-0. *Joint Operations*. Washington DC: US Government Printing Office, 13 February 2008.
- Kometer, Michael W. *Command in Air War: Centralized versus Decentralized Control of Combat Airpower*. Maxwell AFB, AL: Air University Press, 2007.
- Kuhn, Thomas S. *The Structure of Scientific Revolutions*. 3rd ed. Chicago, IL: The University of Chicago Press, 1962.
- Lyon, Charles W. and Andrew B. Stone. "Right Sizing Airpower Command and Control for the Afghanistan Counterinsurgency." *Air & Space Power Journal* (Summer 2011): 5-11.
- Mann III, Edward C. *Thunder and Lighting: Desert Storm and the Airpower Debates*. Maxwell AFB, AL: Air University Press, April 1995.
- Marine Corps Doctrine Publication 6-0. *Command and Control*. Washington DC: Department of the Navy, 4 October 1996.
- Mark, Eduard. *Aerial Interdiction in Three Wars*. Washington DC: Center for Air Force History, 1994.
- Meilinger, Phillip S. *10 Propositions Regarding Air Power*. Washington DC: Air Force History and Museums Program, 1995.
- Mets, David R. *A Companion for Aspiring Air Warriors: A Handbook for Personal Professional Study*. Maxwell AFB, AL: Air University Press, May 2010.
- Momyer, William W. *Airpower in Three Wars*. Washington DC: US Government Printing Office, 1978.
- Osinga, Frans P.B. *Science, Strategy, and War: The Strategic Theory of John Boyd*. New York, NY: Routledge, 2007.
- Overy, Richard. "The Air War in Europe, 1939-1945." In *A History of Air Warfare*, edited by John Andreas Olsen, 27-52. Washington DC: Potomac Books, 2010.
- Pape, Robert A. *Bombing to Win: Air Power and Coercion in War*. Ithaca, NY: Cornell University Press, 1996.
- Paret, Peter. *The Cognitive Challenge of War: Prussia 1806*. Princeton, NJ: Princeton University Press, 2009.
- Quadrennial Defense Review. *Building Partnership Capacity Execution Roadmap*. Washington DC: Deputy Secretary of Defense, 22 May 2006.
- Rhone, Jon M. *Battle Management as a Basic Air Force Doctrine Operational Function*. Master's thesis, US Army Command and General Staff College, 2008.
- Senge, Peter M. *The Fifth Discipline: The Art & Practice of the Learning Organization*. New York, NY: Doubleday, 2006.

- Stephens, Alan. "The Air War in Korea, 1950-1953." In *A History of Air Warfare*, edited by John Andreas Olsen, 85-106. Washington DC: Potomac Books, Inc., 2010.
- Swain, Richard. "Commander's Business: Learning to Practice Operational Design." *Joint Forces Quarterly* 53 (2nd Quarter 2009): 61-68.
- The American Heritage Dictionary*. 2nd ed. Boston, MA: Houghton Mifflin Company, 1991.
- Thompson, Wayne. "The Air War over Korea." In *Winged Shield, Winged Sword: A History of the United States Air Force*. Vol. II, edited by Bernard C. Nalty. Washington DC: Air Force History and Museums Program, 1997.
- U.S. Department of the Air Force. *Global Vigilance, Global Reach, Global Power for America*. Washington DC: Department of the Air Force, 2013.
- U.S. War Department. Field Manual 100-20, *Command and Employment of Air Power*. Washington DC: War Department, 21 July 1943.
- Van Creveld, Martin. *Command in War*. Cambridge, MA: Harvard University Press, 1985.
- Wilsbach, Kenneth S. and David J. Lyle. "NATO Air Command—Afghanistan." *Air & Space Power Journal* (January-February 2014): 11-25.
- Wolk, Herman S. "The Quest for Independence." In *Winged Shield, Winged Sword: A History of the United States Air Force*. Vol. I, edited by Bernard C. Nalty. Washington DC: Air Force History and Museums Program, 1997.